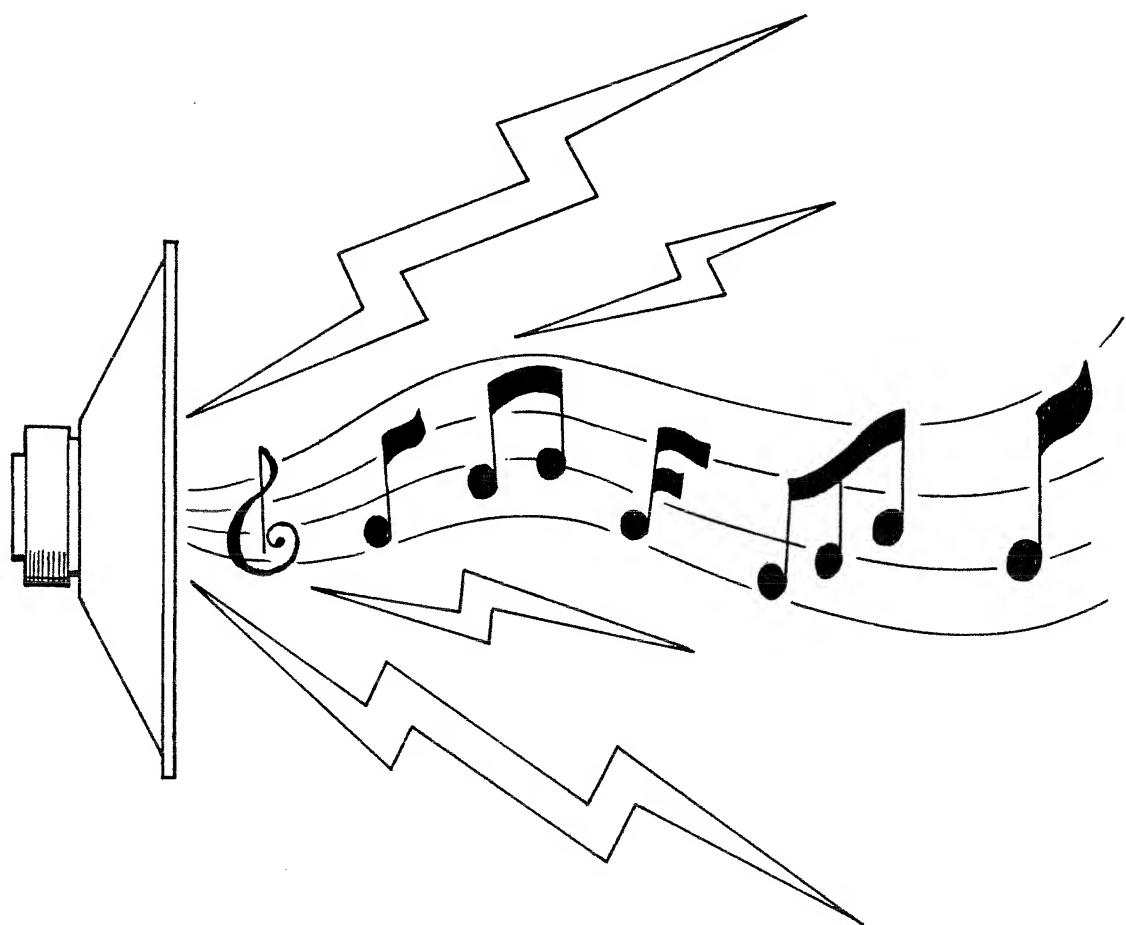


WORLD CUP

SOLID STATE SOUND



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Introduction

The World Cup solid state game has been enhanced by the addition of solid state sounds. An additional P.C. Board in the cabinet and a speaker mounted in the cabinet make up the solid state sound system. All electromechanical chimes and the tilt buzzer have been removed and replaced by the solid state sound board.

The solid state sound board is capable of operating in two modes: musical notes or synthesized sounds. A switch is provided on the sound board to select the sounds desired. In addition, a volume control mounted on the sound board allows for adjusting the sound volume to any level desired.

The sound board also has built in self-test capability to allow for straightforward troubleshooting and repair.

To incorporate the sound board, cabling additions were made to the wiring harness. This manual will detail the changes made, explain how the diagnostics in the game operate, and detail the board operation. Schematics and assembly drawings are provided in this manual to reflect the changes and additions.

Game Operation

World Cup operates with the solid state sounds as follows. When a game is started, the game start tune will be played in musical notes. Any time a score is added to the player's score, a note or synthesized sound (depending on the sound board toggle switch position) will sound. There are four distinct notes or synthesized sounds; according to the value of the score. At the end of the game, the game over tune will be played.

If the match option is enabled and a match occurs, a distinct match sound will occur and then the game over tune will be played.

If the high score to date feature is enabled and is exceeded, the "1812 Overture" tune will be played and then the game over tune will be played.

If, during the course of the game a player tilts the ball in play, a loud tilt sound will sound to indicate the tilt and the tilt lights will light.

BUILT IN DIAGNOSTICS

The addition of the sound board affects only test 02 of the diagnostics.

Solenoid Test - Test 02

When this test is entered, the match digits will display 02 to indicate test 02. This test is controlled by the AUTO/MANUAL switch and the ADVANCE pushbutton. This test is designed to pulse each solenoid for 15 milliseconds. The credit display will indicate the number of the solenoid being pulsed. Refer to Chart 3 for the solenoid identification list. Note that the solenoids numbered 06, 08, 19, 20, 21, and 22 are not used. Also note that 15 milliseconds is too short a pulse duration to actuate the coin lockout coil. Also, the volume control on the sound board must be high enough or no sounds will be heard.

If the AUTO/MANUAL switch is in the AUTO position when this test is entered, the test will automatically sequence from solenoid 01 to 02 to 03, etc. to 22 and back to 01, 02, 03, etc. This continues until either the ADVANCE pushbutton is pressed to go to the next test (switch test - test 03) or the AUTO/MANUAL switch placed in the MANUAL position and the ADVANCE pushbutton pressed, causing the test to cycle only the solenoid where the pause occurred.

If the AUTO/MANUAL switch is in the MANUAL position when this test is entered, the test will operate solenoid 01 repeatedly until the ADVANCE pushbutton is pressed. Then solenoid 02 will be operated repeatedly until the ADVANCE pushbutton is again pressed. Placing the AUTO/MANUAL switch to the AUTO position at any time will cause automatic sequencing to resume. When the ADVANCE pushbutton is pressed with the AUTO/MANUAL switch in the AUTO position, the diagnostics will go to the next test (switch test - test 03).

Chart 3

World Cup Solid State Sound

Solenoid List

01	Left Eject
02	Right Eject
03	Left Shooter
04	Right Shooter
05	Ball Release
06	Not Used
07	Gong Sound
08	Not Used
09	10 Point Sound
10	100 Point Sound
11	1,000 Point Sound
12	10,000 Point Sound
13	Sound Alternator **
14	Credit Knocker
15	Tilt Sound
16	Coin Lockout *
17	Left Jet Bumper
18	Right Jet Bumper
19	Not Used
20	Not Used
21	Not Used
22	Not Used

* Note - 15 msec is
not long enough to
energize this coil.

** When the sound board toggle switch is in the synthesized sounds position, this solenoid causes notes to be played for the start up tune, game over tune, and high score to date tune. During diagnostics, if the switch is in the notes position, musical notes will be heard. If, however, the switch is in the synthesized sound position, the synthesized sounds will be heard on the first pass through test 02 and then musical notes on the second pass and this will continue to alternate.

A quick indication of correct operation of solenoid 13 driver circuit is as follows: if the game start up tune is always notes regardless of the toggle switch position on the sound board, solenoid 13 driver circuit is operating correctly.

SOUND BOARD DIAGNOSTICS

In addition to the CPU Self Test Diagnostics, the Sound Board also has its own microprocessor with diagnostics.

There is one pushbutton on the Sound Board. Pressing this pushbutton causes the microprocessor on the Sound Board to perform a PROM checksum test and then to emit a continuous sine wave.

If no sound is heard, check the volume control level and that the speaker leads are connected to the Sound Board. If some sounds operate but others do not, replace the PROM on the Sound Board. If no sounds are heard at all, check the amplifier portion of the Sound Board circuitry.

To end the diagnostic tone from the Sound Board, the game MUST be turned OFF then ON again.

TROUBLESHOOTING CHARTS

Section 6J - Place Diagnostics in Test 02

SOUND TROUBLESHOOTING CHART

1 SOUND

ALL SOUNDS

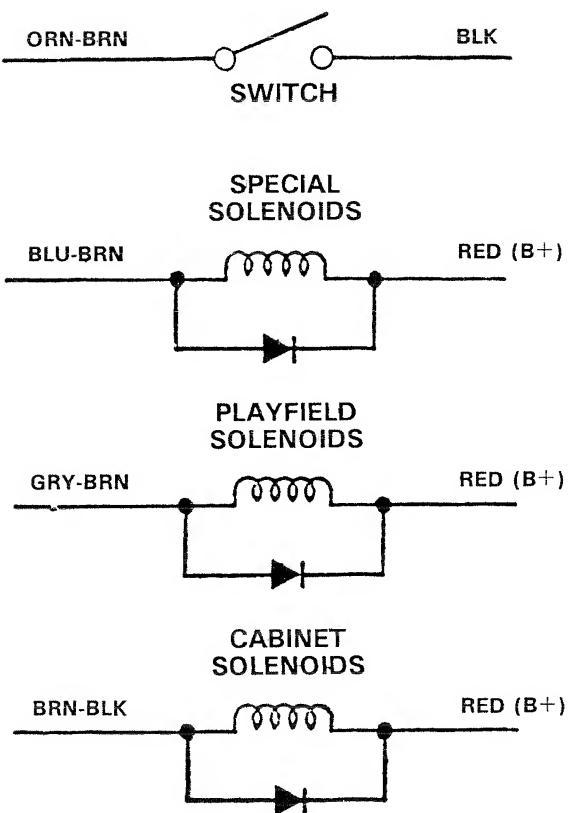
Never Sounds

1. Check Solenoid Chart to verify number correct and in use.
 2. Broken wire to 10J3 connector
 3. Open driver on driver board-replace driver or driver board.
 4. Open buffer on sound board - replace buffer inverter or sound board

Never Sound

1. Check fuse 10F1 on Sound Board.
 2. Check connectors 10J1, 10J2 and 10J3
 3. Check volume control position
 4. Replace Sound Board

TYPICAL WIRING



WORLD CUP SOLENOIDS

FIGURE 8

SPECIAL SOLENOIDS	
SWITCH →	ORN-BRN
COIL →	BLU-BRN
17	LEFT JET BUMPER G-23-750-DC
18	RIGHT JET BUMPER G-23-750-DC
19	NOT USED
20	NOT USED
21	NOT USED
22	NOT USED
ORN-VIO	
BLU-VIO	
RIGHT FLIPPER FL-21-400 33-1300-DC	
ORN-GRY	
BLU-GRY	
LEFT FLIPPER FL-21-400 33-1300-DC	

SOLENOIDS	
PLAYFIELD	CABINET
GRY-BRN	BRN-BLK
1	9
LEFT EJECT G-25-1000-DC	10 POINT SOUND
GRY-RED	BRN-RED
2	10
RIGHT EJECT G-25-1000-DC	100 POINT SOUND
GRY-ORN	BRN-ORN
3	11
LEFT SHOOTER G-25-1000-DC	1000 POINT SOUND
GRY-YEL	BRN-YEL
4	12
RIGHT SHOOTER G-25-1000-DC	10,000 POINT SOUND
GRY-GRN	BRN-GRN
5	13
BALL RELEASE A-23-800-DC	SOUND ALTERNATOR
GRY-BLUE	BRN-BLUE
6	14
NOT USED	CREDIT KNOCKER A2-23-750-DC
GRY-VIO	BRN-VIO
7	15
BELL SOUND	TILT SOUND
GRY-BLK	BRN-GRY
8	16
NOT USED	COIN LOCKOUT M-35-4000-DC

INTERCONNECTION CHARTS

The prefix number 10 is assigned to the three connectors on the Sound Board. The following connectors are changed to incorporate Solid State Sound.

7P1/7J1

CABINET SOLENOIDS & SWITCHES (White-36 Pin)

<u>Pin</u>	<u>Color</u>	<u>Function</u>
1	Yellow	6.3 VAC Display Lamps
2	Yellow-White	6.3 VAC Display Lamps
3	Red	Solenoid B +
4	White	Diagnostic Common
5	Green	Diagnostic Advance
6	Blue	Diagnostic Auto/Man.
7	Orange-Violet	Right Flipper Switch
8	Blue-Violet	Right Flipper Switch
9	Orange-Gray	Left Flipper Switch
10	Blue-Gray	Left Flipper Switch
11	Brown-Black	Coil # 9 10 Point Sound
12	Brown-Red	Coil # 10 100 Point Sound
13	Brown-Orange	Coil # 11 1000 Point Sound
14	Brown-Yellow	Coil # 12 10,000 Point Sound
15	Brown-Green	Coil # 13 Sound Alternator
16	Brown-Blue	Coil # 14 Knocker
17	Brown-Violet	Coil # 15 Tilt Sound
18	Brown-Gray	Coil # 16 Coin Lockout
19	Green-Brown	Switch Column # 1
20	N/C	Not Used
21	White-Brown	Switch Row # 1
22	White-Red	Switch Row # 2
23	White-Orange	Switch Row # 3
24	White-Yellow	Switch Row # 4
25	White-Green	Switch Row # 5
26	White-Blue	Switch Row # 6
27	White-Violet	Switch Row # 7
28	N/C	Not Used
29	Gray-Violet	Coil # 7 Gong Sound
30-36	N/C	Not Used

7P2/7J2 CABINET SWITCHES & DISPLAY LAMPS (White-15 Pin)

<u>Pin</u>	<u>Color</u>	<u>Function</u>
1	Yellow	6.3 VAC Display Lamps
2	Yellow-White	6.3 VAC Display Lamps
3	Red	Coil B +
4	Brown-Gray	Coil # 16 Coin Lockout
5	N/C	Not Used
6	Green-Brown	Switch Column # 1
7	N/C	Not Used
8	White-Yellow	Switch Row # 4
9	White-Green	Switch Row # 5
10	White-Blue	Switch Row # 6
11	White-Violet	Switch Row # 7
12	N/C	Not Used
13	White	Diagnostic Common
14	Green	Advance
15	Blue	Auto/Manual

7P3/7J3 SOUND BOARD POWER (White-9 Pin)

<u>Pin</u>	<u>Color</u>	<u>Function</u>
1	Gray	18.7 VAC
2	N/C	Not Used
3	N/C	Not Used
4	N/C	Not Used
5	Gray-White	18.7 VAC C.T.
6	N/C	Not Used
7	N/C	Not Used
8	N/C	Not Used
9	Gray	18.7 VAC

10P1/10J1 POWER INPUTS

<u>Pin</u>	<u>Color</u>	<u>Function</u>
1	Gray	18.7 VAC
2	N/C	Not Used
3	N/C	Not Used
4	N/C	Not Used
5	Gray-White	18.7 VAC C.T.
6	N/C	Not Used
7	Key	Key
8	N/C	Not Used
9	Gray	18.7 VAC

10P2/10J2 SPEAKER OUTPUT

<u>Pin</u>	<u>Color</u>	<u>Function</u>
1	N/C	Not Used
2	Red	Speaker +
3	Black	Speaker Com
4	N/C	Not Used

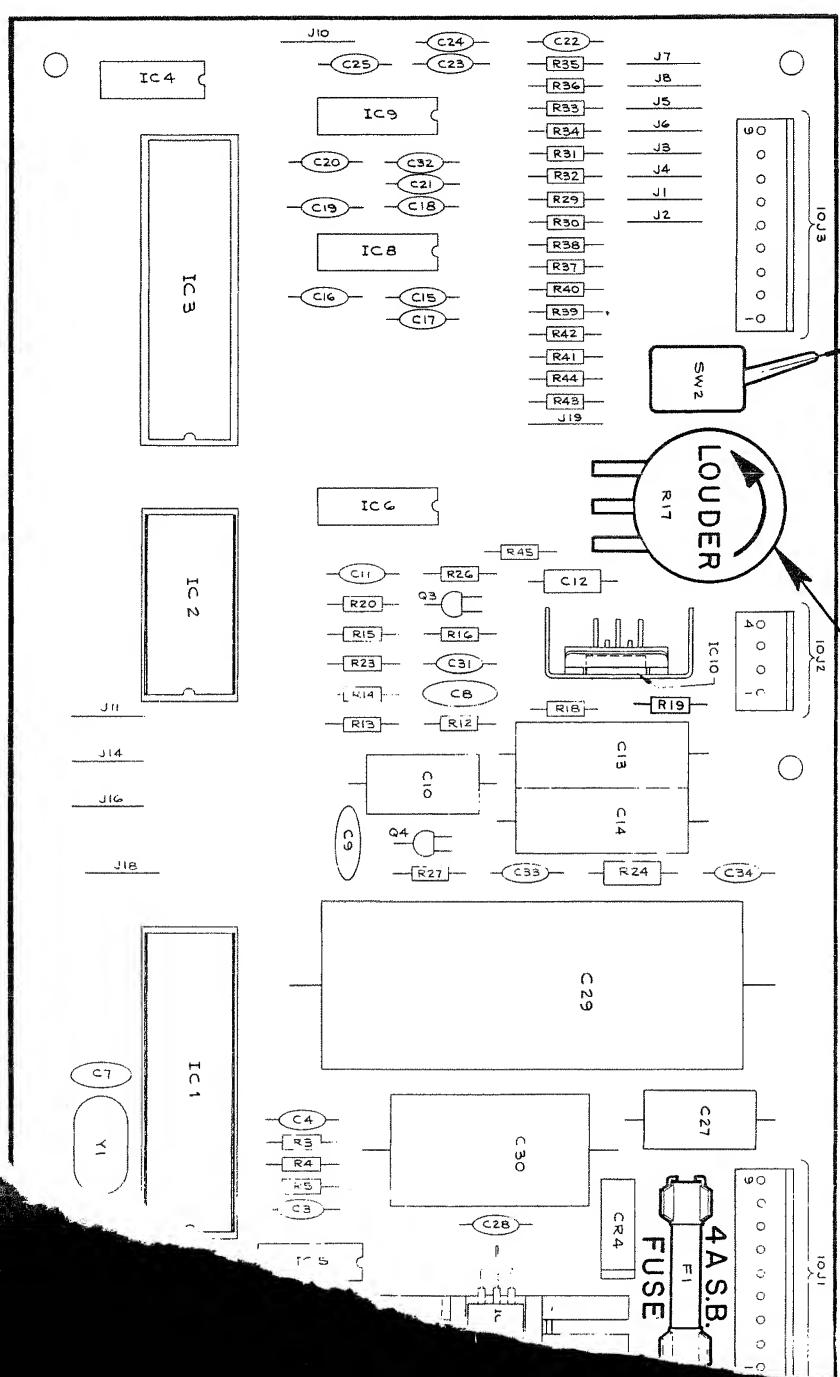
10P3/10J3 SOUND SELECT INPUTS

<u>Pin</u>	<u>Color</u>	<u>Function</u>
1	Key	Key
2	Brown-Red	Solenoid 10 sound
3	Brown-Black	Solenoid 9 sound
4	Brown-Yellow	Solenoid 12 sound
5	Brown-Orange	Solenoid 11 sound
6	Gray-Violet	Solenoid 7 sound
7	Brown-Violet	Solenoid 15 sound
8	Brown-Green	Solenoid 13 sound
9	N/C	Not Used

SOLID STATE SOUND BOARD

SOUND SELECTION SWITCH VOLUME CONTROL

MUSICAL NOTES
SYNTHESIZED SOUND



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